NORTHEAST FLOOD STUDIES

REVIEW OF REPORT
ON SURVEY
FOR FLOOD CONTROL

BLACKSTONE RIVER BASIN

MASSACHUSETTS
AND
RHODE ISLAND

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS WALTHAM, MASS.

28 JUNE 1963

15 July 1963

NOTICE OF REPORT ON FLOOD CONTROL
BLACKSTONE RIVER BASIN
MASSACHUSETTS AND RHODE ISLAND

Notice is hereby given that a report on flood control in the Blackstone River, Massachusetts and Rhode Island, authorized by resolution of the Committee on Public Works of the United States Senate, adopted September 14, 1955, and concerning which a public hearing was held at Uxbridge, Mass., on the 29th of March 1960, has been made by the Division Engineer. The report, titled "Review of Report on Survey for Flood Control, Blackstone River Basin, Massachusetts and Rhode Island" is unfavorable to further improvements in the Blackstone River basin at this time.

An interim report, previously submitted under this authority, was the basis for authorization of a local protection project for Lower Woonsocket, Rhode Island. A flood control dam and two local protection projects in the basin, authorized by the Flood Control Act of 1944, have been constructed and are in operation.

Studies were made of potential flood control reservoir projects and local protection works for areas which had experienced flood

losses in the past. The Division Engineer finds that the completed West Hill Reservoir substantially reduces recurring losses downstream on the West River and along the main Blackstone River. He further finds that the completed Worcester Diversion project, the completed Woonsocket Local Protection project, and the Lower Woonsocket Local Protection project (under construction) will provide a high degree of protection to these areas which were severely damaged in the August 1955 flood. He finds that the cost of the authorized Pawtucket, Rhode Island Local Protection project exceeds the benefits which could be realized by its construction and that, therefore, Federal participation is not warranted at this time. He further finds that the benefits remaining, which could be realized by the reduction of flood stages as a result of construction of any of the studied flood control reservoirs or by the construction of any of the studied local protective works, are insufficient to justify the costs at this time.

In accordance with law, the report is being referred for review to the Board of Engineers for Rivers and Harbors in Washington, D. C. Interested parties may present written views on the report to the Board. Statements submitted should not repeat material previously presented at public hearings held by the Division Engineer, or contained in his report, as this information is already available

to the Board. Information submitted should be new, specific in nature, and bear directly on the findings in the report.

Hearings will be held only on written request, explaining the need to present material not included in the report.

Written communications are to be mailed to the Board of Engineers for Rivers and Harbors, Washington 25, D. C., in time to reach the Board by 15 August 1963. If extension of this date is considered necessary, requests giving reason and additional time desired should be submitted as soon as possible.

The Board considers communications and the report at a date subsequent to expiration of notice. Information furnished by mail receives the same attention as that received at public hearing. Should the Board not be convinced of the soundness of the recommendations in the Report, notice to that effect will be mailed to all known interested parties prior to final action.

Further information may be obtained from this office. Interested parties, including the press, may make such notes of the contents of the report as they desire. However, copies of the report will not be loaned for use outside of the office, but interested parties may purchase copies of the report, or parts thereof, including illustrations at the cost of reproduction. The cost of the complete report is $1.00 per copy. Check or money order should be made payable to the

Treasurer of the United States and should be sent, together with request, to the Division Engineer, U. S. Army Engineer Division, New England, Corps of Engineers, U. S. Army, 424 Trapelo Road, Waltham 54, Mass.

You are requested to give the foregoing information to any persons known by you to be interested in the report and, who, not being known by the Division Engineer, do not receive a copy of this public notice.

P. C. HYZER
Brigadier General, USA
Division Engineer

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM 54, MASS.

ADDRESS REPLY TO:
DIVISION ENGINEER

REFER TO FILE NO.

NEDGW

28 June 1963

SUBJECT: Review of Report on Survey for Flood Control, Blackstone River Basin, Massachusetts and Rhode Island

TO: Chief of Engineers
ATTN: ENGCW-PD
Washington, D. C.

SYLLABUS

The record flood of August 1955 caused unprecedented damage in the Blackstone River basin. Total losses amounted to $65.4 million, exclusive of emergency remedial expenditures under Public Law 875. The completed West Hill Dam and Worcester and Woonsocket Local Protection projects, and the authorized Lower Woonsocket Local Protection project, soon to be placed under construction, would reduce losses over 75 percent in a recurrence of the 1955 flood, under present economic conditions. Added reductions will result from the operation of projects constructed by the Commonwealth of Massachusetts.

The Division Engineer considered various methods of further reducing flood losses in the basin. He finds that future flood losses may be further reduced by the adoption of measures such as flood plain zoning and structural modification, or flood-proofing of structures located in flood-prone areas.

The Division Engineer recommends that no further investigations for flood control in the basin be made under the authority for this report.

1. AUTHORITY

Following the disastrous flood of August 1955, the Committee on Public Works of the United States Senate, on September 14, 1955, adopted a resolution which reads, in part:

> "That the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby, requested to review previous reports on the . . . . . Blackstone River, Massachusetts and Rhode Island . . . . . in the area affected by the hurricane flood of August 1955, to determine the need for modification of the recommendations in such previous reports and the advisability of adopting further improvements for flood control and allied purposes in view of the heavy damages and loss of life caused by such floods."

The Chief of Engineers, by letter dated September 16, 1955, assigned the study and preparation of a report to the New England Division.

2. PRIOR REPORTS

a. The report under review was submitted by the Chief of Engineers on 11 April 1944 and printed as House Document 624, 78th Congress. The four flood control projects recommended therein were authorized by the Flood Control Act of 1944 (Public Law 534, 78th Congress) and are described in paragraph 4a following.

b. In partial response to the authorization for this report, cited in paragraph 1 above, an interim report was prepared on the flood problem in lower Woonsocket, Rhode Island, an area which had suffered devastating damage in the 1955 flood. The report was published as Senate Document No. 87, 85th Congress, and the project recommended therein was authorized by the Flood Control Act of 1960 (Public Law 86-645, 86th Congress). The project is described in paragraph 4b.

3. LOCATION AND DESCRIPTION

The Blackstone River basin, extending through south-central Massachusetts and northern Rhode Island, covers approximately 334

3 8 / 154 / 530 / 541

and 142 square miles of each state, respectively, with a total drainage area of 476 square miles at the dam at Main Street in Pawtucket. Below this dam, the river is tidal and improved for navigation, and is successively known as the Seekonk and Providence Rivers, the latter emptying into the head of Narragansett Bay at Providence, Rhode Island, about 12 miles below the dam at Pawtucket. The principal tributaries include the Quinsigamond, Mumford, West, Branch, and Mill Rivers. The basin is shown on Plate No. 1 accompanying this report.

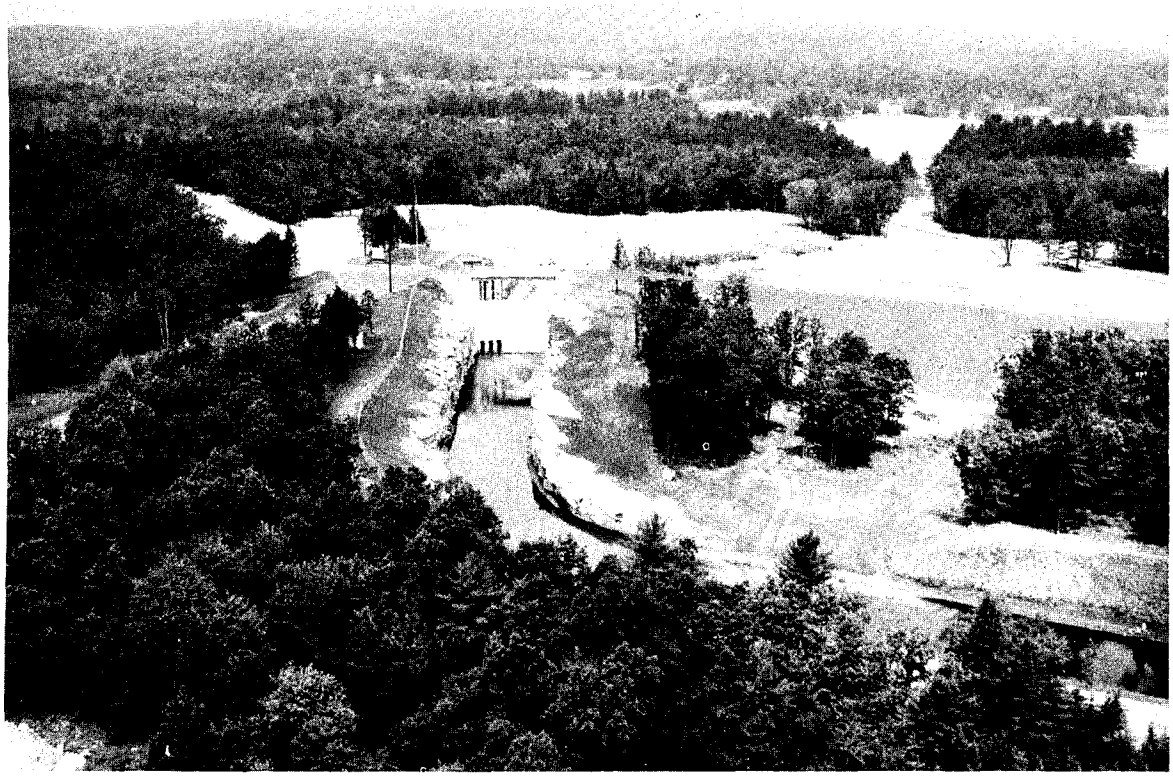
4. EXISTING CORPS OF ENGINEERS FLOOD CONTROL PROJECTS

a. Four flood control projects were authorized by the Flood Control Act of 1944. Three of the projects have been constructed and the fourth, a local protection project for Pawtucket, Rhode Island, is deferred because it presently lacks economic justification. A brief description of the completed projects follows:

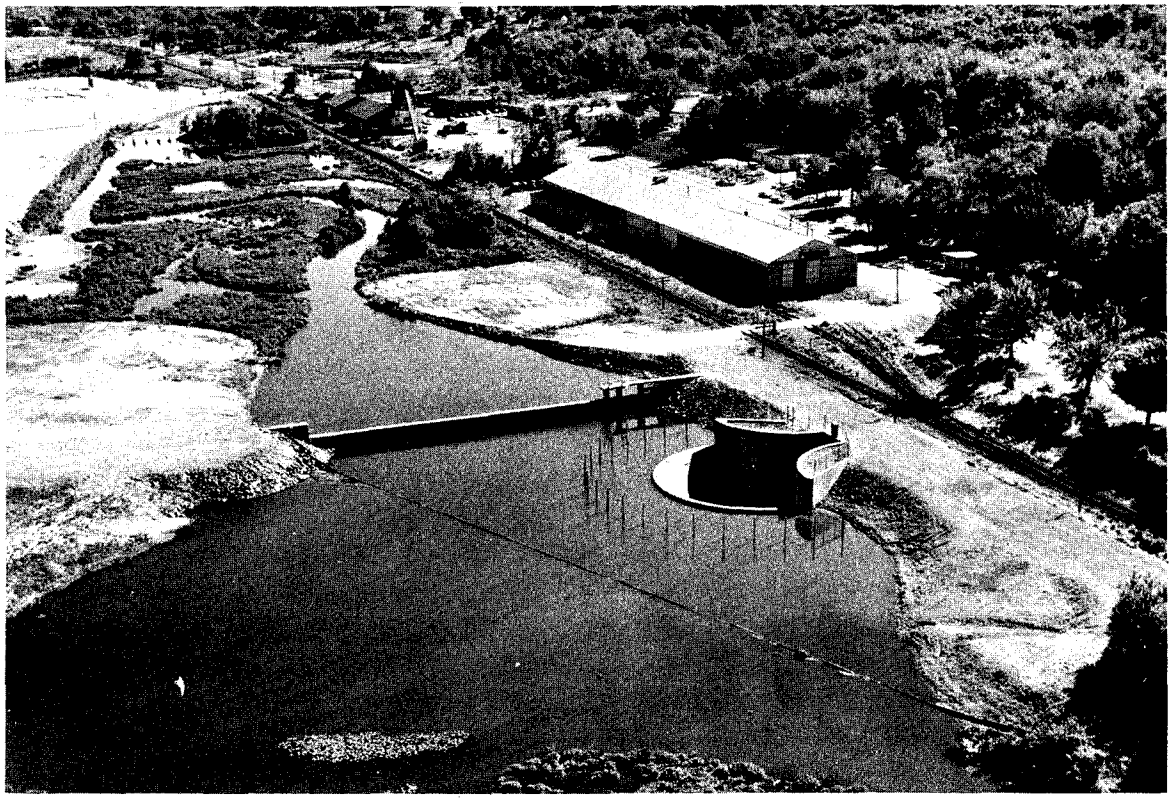
(1) The West Hill Dam and Reservoir, located on the West River in the town of Uxbridge, Massachusetts was completed in 1961 at a cost of $2,230,000. The earth fill dam is 2,400 feet long, has a maximum height of 48 feet, and retains 12,350 acre-feet of floodwater, equivalent to 8.3 inches of runoff from a drainage area of 28 square miles.

(2) The Worcester Local Protection project, located in the towns of Auburn and Millbury, Massachusetts was completed in 1960 at a Federal cost of $4,940,000 and a non-Federal cost of approximately $1,021,000. The project consists of an earth-fill dam that diverts floodwaters from Kettle Brook into a 16-foot diameter, 4,200-foot long concrete tunnel and an open channel 11,300 feet long. The diverted floodwaters bypass the industrial and residential areas of Worcester and flow into the Blackstone River below the city.

(3) The Woonsocket Local Protection project extends from the center of the city of Woonsocket, Rhode Island upstream to the vicinity of the Rhode Island-Massachusetts state line. The project consists of an improved channel 8,300 feet long, replacement of an existing dam with a new 266-foot long dam having four 50-foot tainter gates, four earth dikes totaling 1,310 feet in length, a concrete flood wall 310 feet long, a pumping station, modification of two railroad bridges, replacement of a highway bridge, and three new highway bridges. The project was completed in 1960 at a Federal cost of $4,030,000 and a non-Federal cost of $224,500.

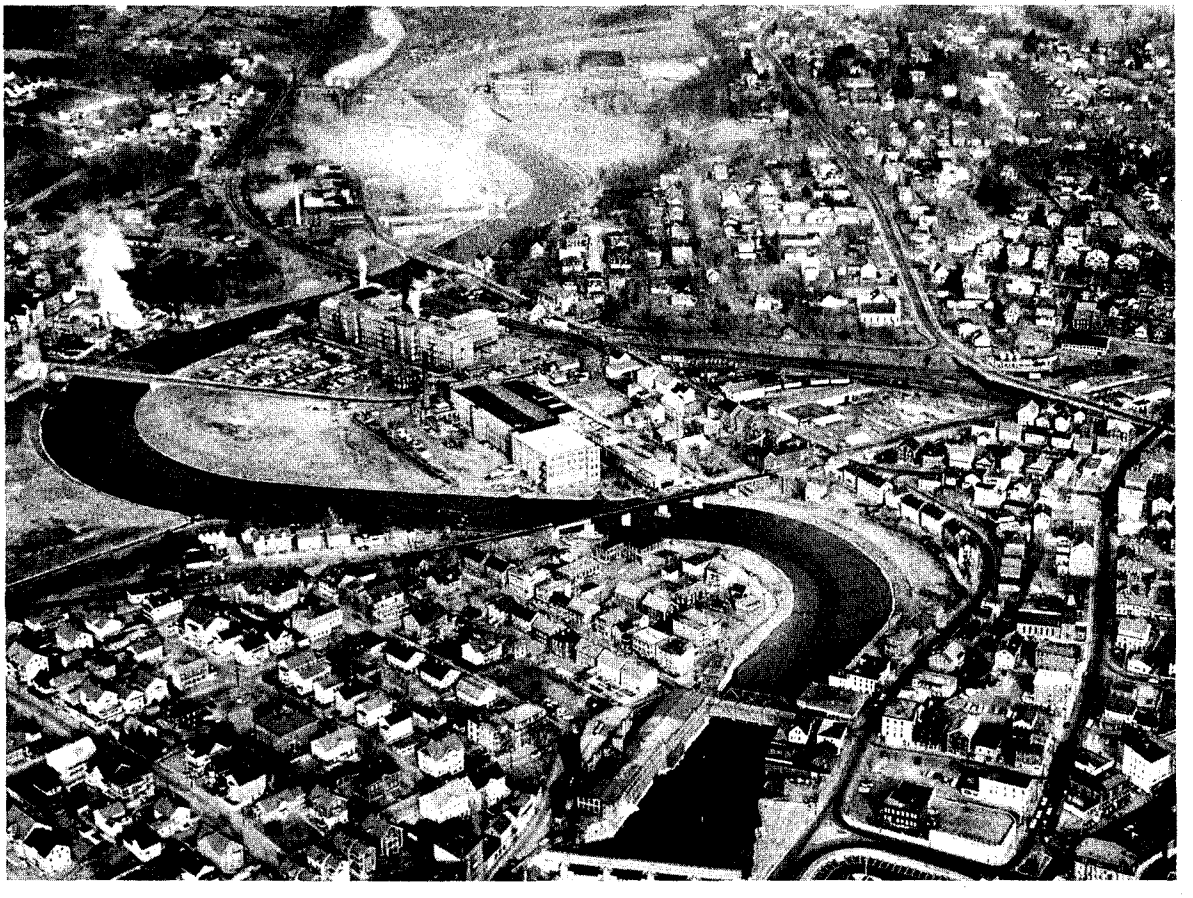


WEST HILL DAM AND RESERVOIR
LOOKING UPSTREAM TOWARD SPILLWAY AND OUTLET WORKS



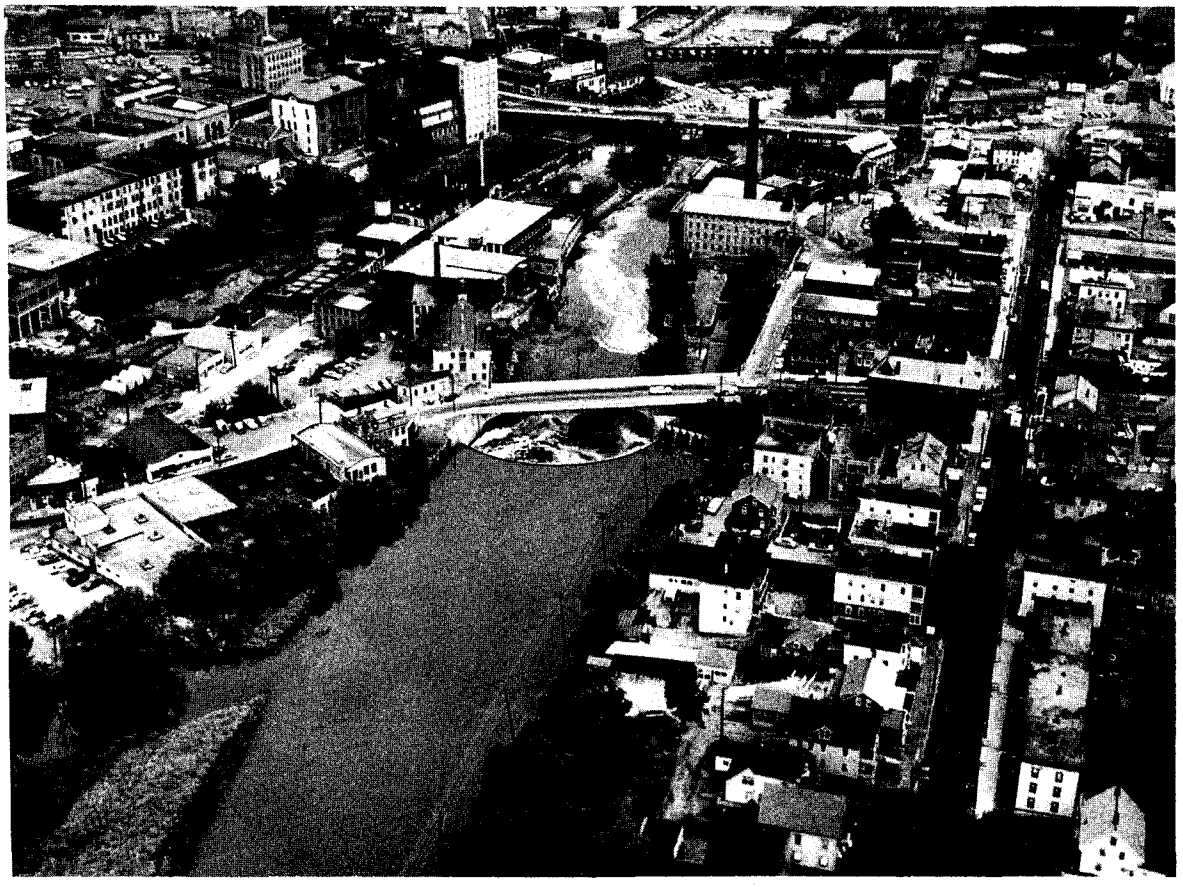
WORCESTER DIVERSION
INTAKE STRUCTURE AND DAM

b. The Lower Woonsocket Local Protection project, authorized by the Flood Control Act of 1960 and placed under construction in 1963, will provide flood protection to the Social District, the Hamlet District, and the Bernon area, located immediately downstream from the completed Woonsocket Local Protection project. The Social District unit will consist of 2,950 feet of earth dike and concrete flood wall and a pumping station along the left bank of the Blackstone River; channel improvement, earth dikes, concrete flood walls, and 1,150 feet of pressure conduit along the Mill River; and earth dikes, concrete flood walls and 1,180 feet of pressure conduit along the Peters River. The Hamlet District unit will consist of removal of the Hamlet Dam and construction of 3,100 feet of earth dike and concrete flood wall, 2,000 feet of channel improvement and a pumping station along the right bank of the Blackstone River. The Bernon



COMPLETED WOONSOCKET LOCAL PROTECTION PROJECT
(LOOKING UPSTREAM)
NEW TAINTER-GATED DAM IN FOREGROUND

unit consists of 250 feet of channel improvement and removal of the Bernon Dam on the Blackstone River. The current estimated cost of the 3-unit project is $7,803,000, of which $5,744,000 is the Federal cost and $2,059,000 the non-Federal cost.



LOWER WOONSOCKET
LOOKING DOWNSTREAM TOWARD BERNON DAM
(HAMLET DISTRICT ON RIGHT, SOCIAL DISTRICT ON LEFT)

5. IMPROVEMENTS BY OTHER AGENCIES

The Massachusetts Department of Public Works, Division of Waterways, has completed or has under construction 18 small flood control projects in Worcester, Shrewsbury, Millbury, Northbridge, Uxbridge, Blackstone, Bellingham, Sutton and Grafton, to cost an estimated total of $5 million.

The State of Massachusetts is considering 15 additional projects for flood improvements in the basin, located at Worcester, Millbury, and Shrewsbury. It is estimated that the total cost of these additional projects would be approximately $5.6 million.

6. EFFECT OF AUTHORIZED PLAN

The record flood in the Blackstone River occurred in August 1955. Flood damages, based on data obtained immediately following the flood, totaled $65.4 million. A recurrence of this flood, assuming economic conditions existing in 1963, would cause damages of $71,9 million. The present plan provides protection for the major existing damage centers and would prevent about $55.5 million of these losses. Projects constructed or planned by the Commonwealth of Massachusetts would prevent additional losses. The remaining areas, which are unprotected by Federal or State projects, are widely scattered throughout the basin.

In addition to flood prevention benefits, the West Hill Reservoir project will be operated to provide maximum possible benefits from recreational use and from use by hunters and fishermen. The upper portion of the reservoir area will be managed by the Massachusetts Division of Fish and Game to provide increased use of this important natural resource.

7. PURPOSE AND EXTENT OF THIS REPORT

This report, the eleventh in a series in response to the authorizing resolution which covers all areas in New England affected by the August 1955 flood, is the second, and last report on the affected area of the Blackstone River basin. The first report formed the basis for authorization of the Lower Woonsocket Local Protection project described in paragraph 4b. Studies for this report comprise a review of flood problems in the remaining watershed of the Blackstone River from its headwaters in Worcester, Massachusetts to Pawtucket, Rhode Island, where the river becomes tidal.

8. DESIRED IMPROVEMENTS

At a public hearing held in Uxbridge, Massachusetts on March 29, 1960, representatives of State and civic interests, industry and commerce, and other individuals proposed improvements including flood control dams and reservoirs, local protective works, channel improvements, river bank protection, modification or removal of dams and bridges, and other improvements allied to flood control. It was also requested that flood problems on Cold Spring, Kettle, Mill, and Singletary Brooks be investigated.

9. PROBLEMS INVESTIGATED

Studies were made of all available means for reducing damage from future floods. These measures include local protective works such as dikes, flood walls, and channel improvement; flood reduction works such as dams and reservoirs; flood-proofing of buildings lying in the flood plain; and the possibility of restrictive zoning to control future construction in flood-prone areas. Reservoir projects were investigated at 24 sites; local protection measures at 22 locations along the main stream and its tributaries. The locations of these studied projects are shown on Plate No. 1. It was found in each case that, under present economic conditions, additional flood protection measures would not be warranted for various reasons including lack of good reservoir sites, the cost of construction, and the reluctance of local interests to participate in the cost of protective measures at this time.

In the studies of prospective reservoir sites, consideration was given to the inclusion of other project purposes. These included recreation, fish and wildlife programs, hydroelectric power development, water supply and water quality control measures. It was found that opportunities at all prospective reservoir sites for beneficial multipurpose development were restricted by the small size of possible developments which limited benefits.

10. SMALL PROJECTS AUTHORITY

Section 205 of Public Law 87-874 provides authority to the Secretary of the Army to construct small projects for flood control and related purposes without specific authorization by Congress, subject to certain limitations and requirements. There are two potential local protection flood control projects of this type in the

Blackstone River basin, one at Millville and one at Uxbridge, Massachusetts. Present information clearly indicates that should either of these projects be eligible for construction, it may be considered for Federal participation under the Section 205 authority.

The nature of the small projects authority is such that other possible projects, requiring investigation, could be introduced by local interests at any time. This report is submitted on the basis that small flood control projects are beyond its scope, and with the understanding that known and future flood protection needs at small areas can be met under the small project authority provided by Section 205 of the Flood Control Act of 1962 (Public Law 87-874).

11. DISCUSSION

Studies made for this report sought possible solutions to flood problems remaining in the basin after flood stage and damage reductions effected by the West Hill Reservoir, the existing and authorized Federal local protection projects and the existing and planned state flood control projects. After extensive investigations, which included the evaluation of 24 reservoir and 22 local protection sites, it is concluded that, except as noted in paragraph 10, no additional projects are economically justified at this time.

12. CONCLUSION

In view of the foregoing, the Division Engineer concludes that completed and authorized flood control works by the Federal Government and the State of Massachusetts will provide a substantial degree of flood protection in the Blackstone River basin. Further consideration, under the small projects authority, may be given to local protection projects at specific localities upon request from local interests. Additional studies under the authority of this report to alleviate flood problems still remaining in the basin are not warranted under current economic conditions and present requirements for Federal participation in projects for flood control and allied purposes.

13. RECOMMENDATION

The Division Engineer recommends that this report be accepted as fulfilling the request and intent of the authorizing resolution.

2 Incls
1. Basin Plan
2. S-148 Supplement

P. C. HYZER
Brigadier General, USA
Division Engineer

BLACKSTONE RIVER BASIN
MASSACHUSETTS AND RHODE ISLAND

Information Called for by
Senate Resolution 148, 85th Congress
Adopted 28 January 1958

1. Flood Problems and Solutions Considered. The record flood of August 1955 caused unprecedented damage to the Blackstone River basin. Total losses amounted to $65.4 million, exclusive of emergency remedial expenditures under Public Law 875. The completed West Hill Dam and Worcester and Woonsocket Local Protection projects, and the authorized Lower Woonsocket Local Protection project (under construction), would reduce losses over 75 percent in a recurrence of the 1955 flood, under present economic conditions. Added reductions will result from the operation of projects constructed by the Commonwealth of Massachusetts. Areas which would still be unprotected are widely scattered throughout the basin.

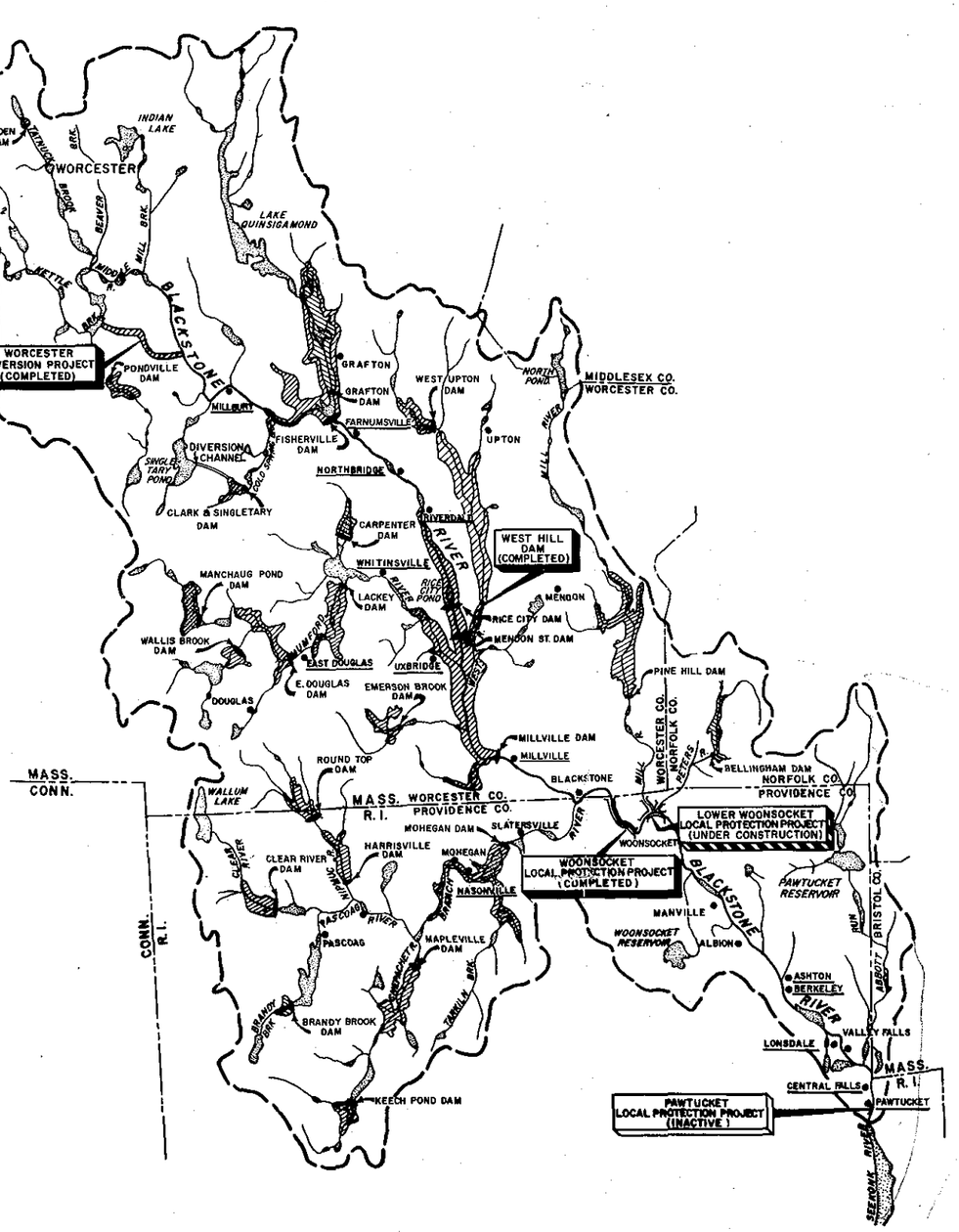
The Division Engineer considered various methods of reducing these remaining losses including local protective works in some 22 areas; dams and reservoirs at 24 sites; flood-proofing of buildings lying in the flood plains; and restrictive zoning to limit future construction in flood-prone areas.

2. Discussion. The Division Engineer found that the authorized plan for the control of floods in the Blackstone River basin is the most effective plan and that additional flood protection measures, under present or anticipated future economic conditions, are not warranted at this time.

Application of the various standards given in S. Res. 148 to the projects considered in the report would not provide a basis for findings differing from those reported.

CORPS OF ENGINEERS

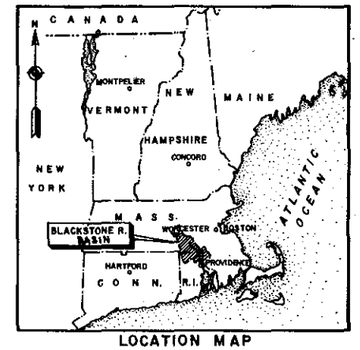
U. S. ARMY



BASIN MAP

SCALE IN MILES

0 2 4



LOCATION MAP

SCALE IN MILES

25 0 25 50

LEGEND

- Completed Flood Control Project
- Flood Control Project Under Construction
- Authorized Flood Control Project
- Town Line
- County Line
- State Boundary
- Existing Reservoir, Pond, or Lake
- Blackstone River Drainage Area
- Flood Control Dam & Reservoir Studied
- ASHTON — Local Protection Project Studied

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY	TR. BY	CK. BY
L.R.M.	J.P.	D.C.

ENGINEER

PROJECT ENGINEER

CHIEF, NORTHEAST FLOOD PROJECTS

SUBMITTED BY

CHIEF, PLANS & SPEC. BRANCH

APPROVED

CHIEF ENGINEERING DIV.

BLACKSTONE RIVER FLOOD CONTROL
BLACKSTONE RIVER BASIN
BASIN & LOCATION MAPS

BLACKSTONE RIVER — MASS. & R.I.

DATE JUNE 1963

TO ACCOMPANY REPORT DATED 28 JUNE 1963

SCALE: AS SHOWN

DRAWING NUMBER BE-1-1314

SHEET

PLATE NO. 1